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Indian Standard

SYNTHETIC TARPAULINS (HEAVY DUTY PROTECTIVE COVERS) MADE FROM COATED NYLON OR POLYESTER FABRICS — SPECIFICATION

ICS 83.140.99

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 1998

Price Group 4

Rubber Products Sectional Committee, PCD 13

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Rubber Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

The heavy duty protective covers (HDPC) made from PVC, EPDM, polychloroprene coated nylon/polyester fabric have been in vogue in developed countries. However in our country only PVC coated HDPC are in use for sometimes. The main characteristics of these covers are very high degree of water proofness, excellent mechanical strength, ease in handling and long useful service life. These HDPC provide very good protection against sun and rain.

NOTE — Nylon/polyester fabrics hereafter will be referred to as synthetic fabrics.

The major uses envisaged are for covering goods transported by truck and open wagons, heavy plants and machinery, equipments, and a variety of critical and high value, items which are stored in open and are sensitive to moisture, rain and sunlight.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the results of a test or analysis, shall be rounded of in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SYNTHETIC TARPAULINS (HEAVY DUTY PROTECTIVE COVERS) MADE FROM COATED NYLON OR POLYESTER FABRICS — SPECIFICATION

1 SCOPE

This standard prescribes requirements, methods of sampling and test for heavy duty protective covers (HDPC) made from PVC coated synthetic fabrics.

2 NORMATIVE REFERENCES

The following Indian Standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision, and parties to agreements based on the standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
285 : 1974	Laundry soaps (*second revision*)
296 : 1974	Sodium carbonate, anhydrous (*second revision*)
1070 : 1992	Water, reagent grade (*third revision*)
2244 : 1972	Glossary of terms relating to treated fabrics (*first revision*)
2454 : 1985	Methods for determination of colour fastness of textile materials to artificial light (Xenon lamp) (*first revision*)
4084 : 1978	Eyelets and washers (sail) (*first revision*)
7016	Methods of test for coated and treated fabrics:
(Part 1) : 1982	Roll characteristics (*first revision*)
(Part 2) : 1981	Determination of breaking strength and extension at break (*first revision*)
(Part 3) : 1981	Tear strength (*first revision*)
(Part 4) : 1987	Resistance to damage by flexing (*first revision*)
(Part 5) : 1987	Determination of coating adhesion strength (*first revision*)
(Part 8) : 1975	Accelerated ageing
(Part 9) : 1988	Determination of blocking resistance (*first revision*)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2244 shall apply.

4 REQUIREMENTS FOR SYNTHETIC FABRICS AND PVC COATING COMPOUND

4.1 Base Fabric

PVC coated synthetic fabrics shall be made from base fabrics of nylon or polyester. The fabrics shall be woven from continuous multifilaments of nylon 6 or 66 and polyester.

4.2 Number of Cuts on the Roll

Number of cuts on the roll shall be restricted to two in a roll of 25 m and the length of single piece shall be not less than 5 m.

4.3 Usable Width

The usable width shall be 91 cm, 115 cm, 122 cm, 137 cm or as agreed to between the purchaser and the supplier.

NOTE — A width of 115 cm is more suitable for cap fabrication. The material is also suitable for ground sheet and protective covering.

4.4 PVC Coating Compound

4.4.1 PVC composition shall be properly compounded with required heat and UV stabilizers, plasticizers, flame retardants (if flame resistance required) and other additives as required.

4.4.2 PVC composition shall be suitably pigmented to impart the required shade.

4.5 Coating

4.5.1 The coating shall be applied uniformly and almost equal coating on each side of the base fabric, it shall be sufficient enough to provide effective heat or high frequency sealing of the fabric.

4.5.2 The coating shall have no disagreeable odour.

4.5.3 The coating shall be continuous and free from pinholes and other visual defects.

4.5.4 The coating shall withstand a continued exposure to a temperature of 100°C for 48 hours without showing signs of exudation or stickiness.

4.5.5 *Surface Finish*

The surface finish may be as agreed to between the purchaser and the supplier.

5 REQUIREMENTS FOR HEAVY DUTY PROTECTIVE COVERS (HDPC) MADE FROM PVC COATED SYNTHETIC FABRICS

5.1 Workmanship

The cover shall be examined on flat illuminated surface suitable for showing up defects. It shall be free from blisters, creases of permanent nature, cuts, pinholes and other visual defects.

5.2 Accelerated Ageing Test

The material shall show no apparent deterioration like softening, stiffening, tackiness, brittleness discoloration and degradation of physical properties when tested for accelerated ageing as per IS 7016 (Part 8). The breaking strength and tear strength of the aged material when tested as indicated in col 4 of Table 1 shall be within the limits specified in Table 1.

5.3 Water Proofness Test

A piece of the sample when subjected to a 150 cm head of water for one hour as per method A_1 or A_2 given in IS 7016 (Part 7) shall not allow water to percolate through and not become wet on its outer surface.

5.4 Resistance to Damage by Flexing

The sample shall pass the flex test for minimum 100 000 cycles when tested as per IS 7016 (Part 4) in normal conditions and 50 000 after ageing at 70 ± 1°C for 168 hours.

5.4.1 When tested by De-Mattia method, according to IS 7016 (Part 4), the material shall comply with the number of flexing cycles given above. The material shall be considered to have complied with the requirements if none of the test pieces has shown signs of cracking to stage 'D' after the first stage and not more than half the test pieces have failed after the second stage of the test. For checking cracking to stage 'D', the middle one third portion which is folded with curvature outside shall be examined according to the following method. In case, there is any doubt as to whether cracking has extended to the base fabrics, bend the flexed test specimen face outwards around a glass rod 6 mm in diameter with a piece of a filter paper between the test specimen and the rod. Brush a suitable coloured fluid, such as red ink containing 2 percent of a wetting agent over the flexed surface and regard the test specimen as cracked only if the ink stains the filter paper.

5.5 Resistance to Cold

The coating shall not crack when a sample specimen of about 100 mm long and about 25 mm wide is subjected to a bending test around 6 mm diameter steel mandrel and exposure of 24 hours at –20°C of the steel pin and coated fabric shall be kept at the required temperature and the test carried out within 60 seconds of removal of the sample. Wherever practicable, the test shall be carried out in a chamber.

5.6 Shear Strength of Joints/Seams

The joints shall be capable of withstanding a load of 100 kg on 5 cm strip when tested by the method prescribed in IS 7016 (Part 2).

5.7 Ease of *in-situ* Repair

It shall be the responsibility of the manufacturer to provide a kit and instructions for repairing of defects/damages that may occur during usage of tarpaulins. This may be either adhesive tapes or solvent based cement as recommended by manufacturer. A trial of repairing a cut may be demonstrated by the manufacturer. In case adhesive tapes are provided for repair, the minimum adhesion of the tape to the material of the tarpaulin shall be 1.5 N per 10 mm width when tested as per Annex A.

5.8 The material for covers shall also meet the requirements given in Table 1.

Table 1 Requirements for PVC Coated Heavy Duty Protective Covers

Sl No.	Characteristics	Requirements for	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Total mass per unit area, g/m^2, *Min*	600	7016 (Part 1)
ii)	Breaking strength, N/5cm, *Min*		7016(Part 2)
	a) Longitudinal direction	2 000	
	b) Transverse direction	2 000	
	After ageing at 70±1°C for 168 h, *Max*		do
	a) Longitudinal direction	20% decrease from original	
	b) Transverse direction	do	
iii)	Tear strength, N, *Min*		Method A-2 of 7016 (Part 3)
	a) Longitudinal direction	200	
	b) Transverse direction	200	
	After ageing at 70±1°C for 168 h, *Max*		do
	a) Longitudinal direction	20% decrease from original	
	b) Transverse direction	do	
iv)	Coating adhesion, N, *Min*	40	7016(Part 5)
v)	Heat ageing, mass loss of coating,percent, *Max*	4	7016(Part 8)
vi)	Blocking	Separation without damage to coating	7016 (Part 9)
vii)	Dimensionsal change due to shrinkage, both side, *Max*, percent	3	Annex B

5.9 Colour Fastness Requirements

The material shall comply with the requirements given in Table 2.

Table 2 Colour Fastness Requirement

Sl No	Characteristic	Requirements	Methods of Test, Ref to
(1)	(2)	(3)	(4)
i)	Colour fastness to light, *Min*	4	IS 2454
ii)	Colour fastness to rubbing, *Min*	Coating shall not stain	Annex C

5.10 Optional Requirement

5.10.1 *Flame Resistance Test*

5.10.1.1 The fabric shall be tested for flame resistance as described in Annex D. The duration of flaming of the specimen tested shall not exceed 20 seconds after removal of the source of ignition.

5.10.2 *Fusion*

When tested as per Annex E no cracking or disintegration of face coating shall be observed.

6 CONSTRUCTION OF HEAVY DUTY PROTECTIVE COVERS

6.1 Materials

6.1.1 HDPC shall be made from PVC coated synthetic fabrics.

6.1.2 *Eyelets*

Aluminum alloys NS or NS 4 conforming to size 30 of IS 4084 shall be used. Brass eyelets and other kinds of eyelets as per customer's requirements may also be used.

6.1.3 The HDPC shall be made to the shade and dimensions as agreed to between the purchaser and the supplier. Each tarpaulin should be made with panels of even shade as far as possible.

6.1.4 The panels shall be lap jointed. The ends and sides of the covers shall be hemmed by heat sealing. The hem shall be about 40 mm wide. The lap joint of the covers shall not be less than 20 mm in width and shall be made by heat high frequency sealing throughout the length. Cross seams may be used at the rate of one in every third panel and no piece shall be less than 500 mm in length shall be used for making the panel. The cross seam shall be made by 'lap joint' method of width 20 mm by way of heat sealing. Narrow width panels not less than 250 mm in width, may be used at the rate of one per cover to obtain required width. In all cases, however, the end panels shall be of full width except where the width of the cover is less than 2 meters in which case one of the end panels may be less than the full width. The alternate short panels for cross joints shall be in opposite ends. The seams shall be fully done by heat sealing in the direction of length.

6.2 Fixing of Eyelets

Unless otherwise, agreed to between the purchaser and the supplier, the eyelets shall be fixed at an interval of about 100 cm on all sides. Only one eyelet shall be used at corners. The eyelets shall be fitted in a row. The holes for the eyelets shall be first punched with a small size punch. These small holes may then be enlarged to the required size by using a marline spike. The center of these eyelets shall be at a distance of 20 mm from the outer edge of the hem.

6.2.1 The lashing ropes shall be supplied if required by the purchaser and in that case shall be fixed to the eyelets by splicing. The number and length of the lashing ropes shall be as agreed between the purchaser and the suppler. The free ends of the lashings shall be securely whipped with twine whipping, the end being sown at least in 3 places to prevent the whipping from pulling off.

6.2.2 The covers shall be measured by laying it on a plain surface fully spread out. The tolerance of ± 1 percent will be permitted provided the average area of all the tarpaulins in a consignment is not less than the calculated on sizes stipulated by the purchaser.

7 PACKING AND MARKING

7.1 Packing

The tarpaulins shall be packed as agreed to between the purchaser and the supplier.

7.2 Marking

Each tarpaulin shall be legibly marked at one corner on one side with the following:

a) Name of the material;
b) Manufacturer's name, initials or trade-mark;
c) Year of manufacture;
d) Batch/Lot No.; and
e) Size.

7.2.1 *BIS Certification Marking*

The tarpaulin may also be marked with Standard Mark.

7.2.1.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8 SAMPLING

8.1 Unless otherwise agreed to between the purchaser and the supplier, the number of covers to be selected at random a lot (that is belonging to same batch of manufacture) shall be as given in Table 3 .

Table 3 Scale of Sampling for Non-critical Requirements

(*Clause* 8 *and* 9)

No. of Tarpaulins in the Lot	Sample Size	Permissible Number of Defectives	Sample Size for Critical Requirement
(1)	(2)	(3)	(4)
Up to 50	3	0	1
51 to 150	5	0	2
151 to 300	8	0	3
301 to 500	13	1	4
501 and above	20	2	5

9 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

9.1 The number of covers selected according to col 1 and 2 of Table 3 shall be examined for non-critical (visual dimensional and tactile) requirements. A cover failing in one or more of these requirements, shall be considered as defective. The lot shall be considered to have satisfied these requirements if the number of defective found in the sample is less than or equal to the corresponding acceptance number given in col 3 of Table 3.

9.2 The number of covers as given in col 4 of Table 3 shall be tested for critical requirements (other than non-critical). These covers may be selected from those, already tested and found satisfactory according to **9.1**. A cover failing in any of these requirements, shall be considered as defective. The lot shall be considered to have met these requirements if none of the covers in the sample is defective.

9.3 The lot shall be declared as conforming to the requirements of the specification if **9.1** and **9.2** are satisfied.

10 QUALITY OF REAGENTS

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be employed in tests.

NOTE — 'Pure chemicals 'shall mean chemicals that do not contain impurities which affect the results of analysis.

ANNEX A

(*Clause* 5.7)

METHOD OF TEST FOR DETERMINATION OF EASE OF REPAIR OF COVER BY ADHESIVE TAPE

A-1 OUTLINE OF THE METHOD

Ease of repair of tarpaulin covers by adhesive tape shall be determined by finding the force required to peel a strip of tape from the surface on which it is applied at a specified angle and speed.

A-2 PROCEDURE

A-2.1 Cut a specimen of 10 cm × 25 cm size from the tarpaulin cover extended material provided for testing. Clean the surface of specimen with a clean piece of untreated tissue paper, cotton wool or cotton cloth. Apply 30 cm of the adhesive tape of minimum 3 cm width on the specimen in the manner that tape lies centrally on the specimen extending beyond the specimen to be accommodated in the testing equipment.

A-2.2 Place the roller centrally across the test specimen, once in each direction at constant speed of approximately 30 cm/min ensuring that no air bubble is trapped between the tape and the specimen. Fold the free end of the tape at an angle 180° and peel of 3 cm from the specimen leaving 22 cm in contact. Clamp the specimen in the lower jaw of tensile testing machine (a pendulum or spring balance type). Attach the free end of tape to the head of the tension measuring device and disengage the pawls if any. Start the tensile testing machine taking reading at 2 cm intervals when the tape is pulled from specimen. Disregard the first 5 cm and last 3 cm. The load required the cause the separation of the tape from the specimen shall be reported in N/cm. The mean of 5 readings shall give the result. If the tape breaks during the test, report the test on another set of test specimens.

ANNEX B

[*Table* 1, *Sl No.* (vii)]

METHOD OF TEST FOR DETERMINATION OF DIMENSIONSAL CHANGE

B-1 PROCEDURE

Cut a specimen 30 cm × 30 cm with two sides parallel to the longitudinal direction. Draw lines parallel and perpendicular and make a square of 25 cm. Measure the distance between the marked lines to the nearest millimetre. Immerse the specimen completely under the surface of water containing a suitable wetting agent maintained at a temperature between 25 to 30°C. Use suitable means such as small weight, to keep it sumberged. Leave the specimen to soak for 2 hours, then rinse it in plain water and leave it to dry on a flat surface at a temperature between 25 to 30°C. Dry the material, under standard atmospheric conditions for 24 hours and measure the distance between the lines.

B-2 CALCULATION

Calculate the percentage of shrinkage between each pair of datum marks by the relation:

$$\text{Shrinkage, percent} = \frac{100\,(L_1 - L_2)}{L_1}$$

where

L_1 = distance between the lines before shrinkage treatment, and

L_2 = distance between the lines after shrinkage treatment

B-3 REPORT

Report the mean shrinkage separately for the warp and weft directions correct to within 0.1 percent.

ANNEX C

[*Table* 2, *Sl No.* (ii)]

METHOD OF TEST FOR DETERMINATION OF COLOUR FASTNESS TO DRY AND WET RUBBING

C-1 APPARATUS

C-1.1 The apparatus shown in Fig. 1 shall consist of an abrading member *A* and a means of clamping the test piece over a plate glass surface *B* in such a manner that the abrading member and the test pieces are capable of relative reciprocating motion in a straight line. The amplitude of reciprocation, that is the stroke shall be 100 mm and the apparatus shall be mechanically operated or hand driven so that the rate of reciprocation shall be 15 ± 2 cycles (each of two strokes) per minute.

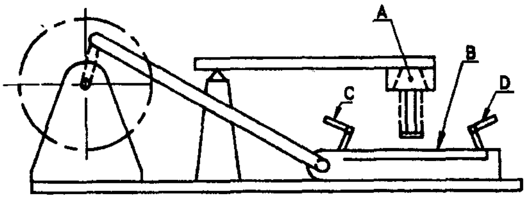


FIG. 1 APPARATUS FOR MEASURING COLOUR FASTNESS TO DRY AND WET RUBBING AND ADHESION TO PRINT

C-1.2 Abrading Member

The abrading member *A* shown in Fig. 2, shall consist of a brass peg and shall be suitably and firmly secured to the arm of the apparatus so that its centre line is at right angles to the surface of the glass plate. The arms of the apparatus shall be not less than 230 mm in length measured from the centre point of the abrading member to the pivot, and shall be loaded in such a manner that the brass peg exerts a load of 5 N on the test piece. Means shall be provided for firmly securing a strip of the specified bleached fabric around the end of the brass peg, a screw clip having been found suitable for this purpose. Suitable grips *C* and *D* shall be provided to ensure that the test piece may be secured firmly across the plate glass surface (*see* Fig. 1).

C-1.3 White Cotton Fabric

Bleached but not starched and in sufficient quantity for testing all the specimens. The fabric shall have approximately 400 ends per decimetre and 250 picks per decimetre with the yarn count of 36 tex and 38 tex in warp and weft directions respectively.

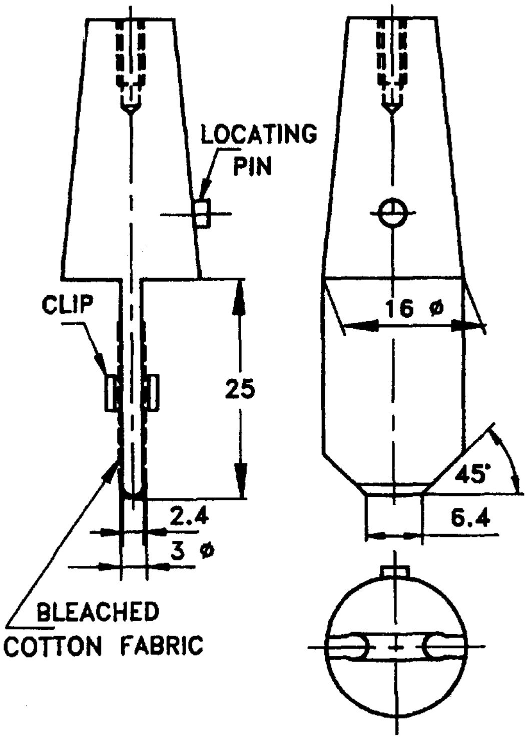
C-2 TEST SPECIMENS

C-2.1 Cut from the sample at random not less than six rectangular pieces, 250 mm long and 50 mm wide, with their length parallel to the warp direction. Condition the test specimens for not less than 2 hours in the standard atmosphere and carry out the subsequent testing in that atmosphere.

C-3 PROCEDURE

C-3.1 Dry Rubbing

Cut a circle, 25 mm in diameter, from the bleached fabric (*see* **C-1.3**) and attach to the undersurface of the abrading member of the apparatus, using the clip. Mount the test specimen with the coated side uppermost, over the plate glass surface such that the 'stroke' falls symmetrically within the dimensions of the test piece. Firmly secure the test piece in position by means of suitable grips, wipe with cotton-wool to remove dust and subject it to abrasion. Stop the test after 10 complete abrading cycles. Remove the fabric from the abrading member and examine the area of the fabric which has been in contact with the specimen for discoloration.



All dimensions in millimetres.

FIG. 2 DETAILS OF ABRAIDING MEMBER A

C-3.2 Wet Rubbing

Carry out the test in a similar way as under **C-3.1** using a circle of bleached dipped in soap-soda solution containing 5 g of soap (*see* Type 2 of IS 285) and 2 g of sodium carbonate (*see* IS 296) in one litre of water, immediately prior to mounting on the abrading member. Subject the test piece to 10 complete abrading cycles and examine the area of the fabric which has been in contact with the specimen for discoloration.

ANNEX D

(*Clause* 5.10.1)

METHOD OF TEST FOR DETERMINATION OF FLAME RESISTANCE

D-1 APPARATUS

D-1.1 Metal Stand

A stand shown in Fig. 3 shall have the size 300 mm × 300 mm, shielded from three sides up to 250 mm. The upper frame of the stand shall be used to fix the test specimen.

D-1.2 Bunsen Burner

Bunsen burner with 10 ± 1 mm internal diameter, with a supply of liquefied petroleum gas.

D-1.3 Paper Clamps

Large paper clamps shall be suitable to hold the specimen in slight tension (The paper clamps are similar to those used by students to clip paper on wooden board or plastic sheet).

D-1.4 Adjustable stand or wooden blocks to adjust the height of the burner.

D-1.5 Pinch cock for adjusting the height of the flame of the burner.

D-1.6 Stop watch of an accuracy 0.2 seconds.

D-2 TEST SPECIMEN

D-2.1 Cut from the sample a rectangular piece (sufficient to have enough length to be folded around the rods of the frame and clamped) of size 300 mm × 400 mm.

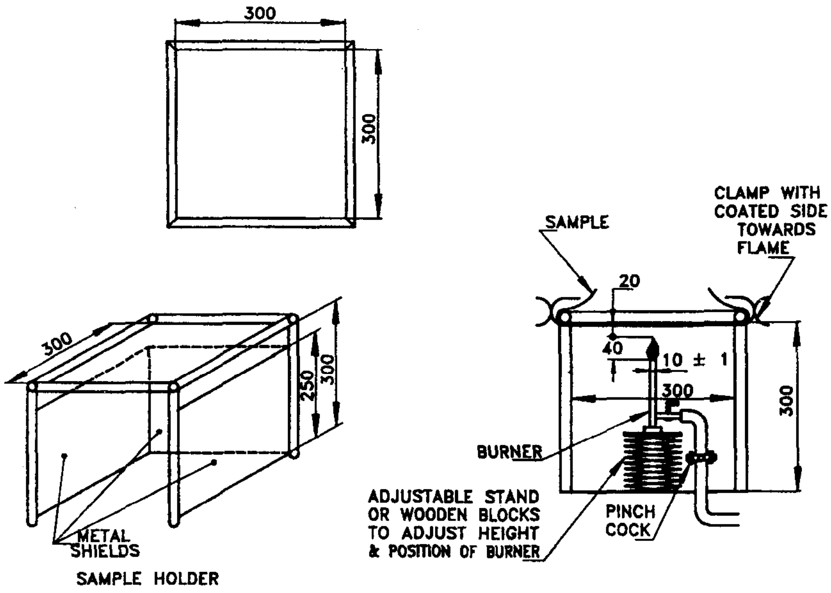
D-3 PROCEDURE

D-3.1 Set up the apparatus in a fume cupboard, support the test specimen horizontally, with the coated size of the fabric towards the flame, by means of four paper clamps, to each on the opposite sides of the specimen in such a manner that area of 300 mm × 300 mm will be exposed to flame without sag.

D-3.2 Shut off, completely, the air supply to the burner and adjust the burner to give a luminous flame of 40 mm length by means of the pinch cock. Place the burner in such a position that the tip of the flame is 20 mm below the centre of specimen. Apply the flame for a period of 20 seconds and then withdrawn it.

D-3.3 Record separately by stop watch the time during which flaming continues.

D-3.4 The finished fabric when tested shall meet the requirement of **5.10.1**.


300
300
300
250
300
METAL SHIELDS
SAMPLE HOLDER
SAMPLE
CLAMP WITH COATED SIDE TOWARDS FLAME
20
40
10 ± 1
300
300
BURNER
ADJUSTABLE STAND OR WOODEN BLOCKS TO ADJUST HEIGHT & POSITION OF BURNER
PINCH COCK

All dimensions in millimetres.

FIG. 3 APPARATUS FOR FLAME RESISTANCE TEST

ANNEX E

(*Clause* 10.2)

METHOD OF TEST FOR DETERMINATION OF CHECKING FUSION

E-1 REAGENTS AND APPARATUS

E-1.1 Acetone — analytical reagent grade.

E-1.2 Glass Vessel — to contain the test assemblies and which may be covered by a glass plate.

E-1.3 Glass Rod — of diameter 5 mm.

E-1.4 Metal Clips

E-2 TEST PIECES

E-2.1 Depending on the thickness of the coated fabric, cut three test pieces of dimensions either 20 mm × 40 mm or 20 mm × 70 mm. The test pieces should, if possible, be taken one near the centre and the other at least 200 mm from the sides of the sample. If the material under test is coated on both sides, the number of test pieces should be increased to six so that three test pieces can be examined per coated face.

E-3 PROCEDURE

E-3.1 Examine the PVC layer of the test piece for cracks or holes and record the result. Fold each test piece over the glass rod with the coating under test outwards. Secure each test piece with a suitable metal clip and immerse the assembly in the acetone in the vessel at standard laboratory temperature.

E-3.2 After 15 min, remove each assembly from the acetone and examine visually for new cracks or holes. Disregard any removal of lacquer or surface effects.

E-4 EXPRESSION OF RESULTS

If fresh cracks and holes have appeared in the bent area, report that fusion incomplete.

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